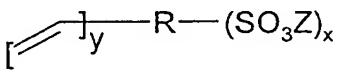
Claims

1. Proton-conducting electrolyte membrane obtainable by a process comprising the steps:
   A) swelling a polymer film with a liquid comprising a vinyl-containing sulphonic acid and
   B) polymerising the vinyl-containing sulphonic acid present in liquid introduced in step A).

2. Membrane according to claim 1, characterised in that the film used in step A) exhibits swelling of at least 3 % in the liquid comprising a vinyl-containing sulphonic acid.

3. Membrane according to claim 1, characterised in that the polymers used in step A) are polymers that are stable at high temperatures and contain at least one nitrogen, oxygen and/or sulphur atom in one or more repeat units.

4. Membrane according to claim 1, characterised in that the liquid comprising a vinyl-containing sulphonic acid contains compounds of the formula



wherein

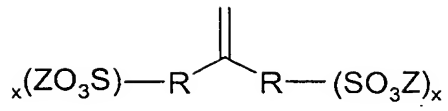
R represents a bond, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals may in turn be substituted by halogen, -OH, COOZ, -CN, NZ_2,

Z represents, independently of one another, hydrogen, C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals may in turn be substituted by halogen, -OH, -CN, and

x represents an integer 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10

y represents an integer 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10

and/or of the formula



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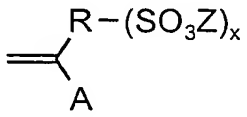


wherein

A represents a group of the formulae $COOR^2$, CN, $CONR^2_2$, OR^2 and/or R^2, wherein R^2 represents hydrogen, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals may in turn be substituted by halogen, -OH, COOZ, -CN, NZ_2

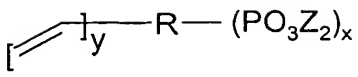
R represents a bond, a divalent C1-C15 alkylene group, divalent C1-C15 alkyleneoxy group, for example ethyleneoxy group or divalent C5-C20 aryl or heteroaryl group, in which the aforementioned radicals may in turn be substituted by halogen, -OH, COOZ, -CN, NZ_2,

Z represents, independently of one another, hydrogen, C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals may in turn be substituted by halogen, -OH, -CN, and

x represents an integer 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10.

5. Membrane according to claim 1, characterised in that the liquid comprising a vinyl-containing sulphonic acid contains phosphonic acid.

6. Membrane according to claim 5, characterised in that the liquid comprising a vinyl-containing sulphonic acid contains compounds of the formula



wherein

R represents a bond, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals may in turn be substituted by halogen, -OH, COOZ, -CN, NZ_2,

Z represents, independently of one another, hydrogen, C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals may in turn be substituted by halogen, -OH, -CN, and

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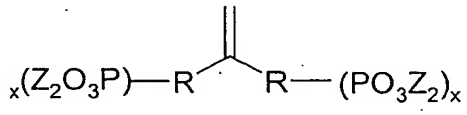
and/or of the formula



wherein

R represents a bond, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals may in turn be substituted by halogen, -OH, COOZ, -CN, NZ_2,

Z represents, independently of one another, hydrogen, C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, in which the aforementioned radicals may in turn be substituted by halogen, -OH, -CN, and

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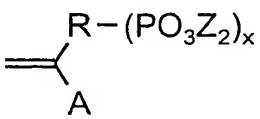

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x represents an integer 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10.

7. Membrane according to claim 5 or 6, characterised in that the ratio by weight of vinyl-containing phosphonic acid to vinyl-containing sulphonic acid lies in the range of 1:100 to 99:1.

8. Membrane according to claim 1, characterised in that the liquid comprising a vinyl-containing sulphonic acid contains monomers capable of crosslinking.

9. Membrane according to claim 1, characterised in that the liquid comprising a vinyl-containing sulphonic acid contains at least one substance capable of forming radicals.

10. Membrane according to claim 1, characterised in that the polymerisation in step C) is carried out by irradiation with IR or NIR light, UV-light, ß, γ and/or electron rays.

11. Membrane according to claim 1, characterised in that the membrane has inherent conductivity of at least 0.001 S/cm.

12. Membrane according to claim 1, characterised in that the membrane contains between 1 and 90 % by weight of the polymer and between 99 and 0.5 % by weight of polyvinyl sulphonic acid.

13. Membrane according to claim 1, characterised in that the membrane comprises a layer containing a catalytically active component.

14. Membrane electrode unit containing at least one electrode and at least one membrane according to one or more of claims 1 to 13.

15. Fuel cell containing one or more membrane electrode units according to claim 14 and/or one or more membranes according to any one of claims 1 to 13.